Instructions –

(1) All Questions are *Compulsory*.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any TEN of the following:**

   a) Draw and label pins of IC 741.
   
   b) Define range and span.
   
   c) State seebeck effect.
   
   d) State four points to be considered while selecting transducer.
   
   e) State working principle of A/D converter.
   
   f) Draw the diagram for force measurement using lead cell.
   
   g) State the difference between volumetric flow rate and mass flow rate.
   
   h) State any four objectives of DAS.
   
   i) Define fideality and measuring lag.
   
   j) Define supply v.tg. rejection ratio and output v.tg. swing.
   
   k) Compare NTC and PTC thermistor (two points).
   
   l) List four different units of pressure.
2. Attempt any FOUR of the following: 16
   a) Draw and explain response of second order system for step input.
   b) Define calibration. Explain process of calibration in detail.
   c) Define gauge factor. Explain the working principle of strain gauge.
   d) State working principle of column type load cell and state its any four applications.
   e) Define transducer and give in detail classification.
   f) Explain in brief the concept of virtual ground in op-amp.

3. Attempt any FOUR of the following: 16
   a) Draw and explain block diagram of instrumentation system.
   b) Define following term:
      (i) Precision
      (ii) Drift
      (iii) Static error
      (iv) Dead zone
   c) Define:
      (i) Gauge pressure
      (ii) Atmospheric pressure
      (iii) Differential pressure
   d) Draw and explain ultrasonic method of liquid level measurement.
   e) State principle of hall effect transducer and explain its working in detail.
   f) Draw a neat diagram of turbine flowmeter and explain its working.
4. **Attempt any TWO of the following:**

   a) With the help of neat labelled describe how pressure can be measure using LVDT.

   b) Compare:
      (i) RTD and Thermistor (any four points).
      (ii) Active transducer and Passive transducer (any four points).

   c) Draw the block diagram of multichannel data acquisition system and explain in detail.

5. **Attempt any TWO of the following:**

   a) Explain the concept of comparator. Draw and explain the working of schmitt trigger.

   b) State and explain different signal conditioning techniques used in DAS.

   c) Explain the measurement set up used for speed measurement using non-contact type of transducer.

6. **Attempt any FOUR of the following:**

   a) Draw:
      (i) Adder
      (ii) Substructor circuit using op-amp.

   b) Explain op-amp as a integrator.

   c) Explain working rotary encoder.

   d) Explain how AC current is measured using hall effect transducer.

   e) Explain liquid level measure by resistive sensor.

   f) With the help of mathematical expression describe dynamic response of first order instrument.